Weiwei "William" Kong
Curriculum Vitae

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Research Interests

Nonconvex Optimization, Convex Optimization, Accelerated First-Order Methods, Proximal Point Methods, Constrained Optimization, Optimization Algorithms, Computational Complexity, Optimization Software, Min-Max Optimization

Education

2016–2021   **Ph.D.** in Operations Research
Georgia Institute of Technology, Atlanta GA, USA

» *Dissertation Title*: "Accelerated Inexact First-Order Methods For Solving Nonconvex Composite Optimization Problems"

» *Committee*: Arkadi Nemirovski, Guanghui Lan, Renato D.C. Monteiro (Chair), Santanu S. Dey, Edmond Chow,

» *Advisor*: Renato D.C. Monteiro

2018–2019   **M.Sc.** in Computational Science and Engineering
Georgia Institute of Technology, Atlanta GA, USA

2010–2014   **B.Math.** in Mathematical Finance
University of Waterloo, Waterloo ON, Canada

Publications

1. **Kong, W.**, Krichene, W., Mayoraz, N., Rendle, S., & Zhang, L. (2020). Rankmax: An Adaptive Projection Alternative to the Softmax Function. *Proceedings of Advances in Neural Information Processing Systems 33 (NeurIPS 2020)*.

2. **Kong, W.**, Melo, J. G., & Monteiro, R. D.C. (2020). An efficient adaptive accelerated inexact proximal point method for solving linearly constrained nonconvex composite problems. *Computational Optimization and Applications*, 76(2), 305-346.

3. **Kong, W.**, & Monteiro, R. D.C. (2019). An accelerated inexact proximal point method for solving nonconvex-concave min-max problems. *arXiv preprint arXiv: 1905.13433*. (Accepted for publication in *SIAM Journal on Optimization*)

4. **Kong, W.**, Melo, J. G., & Monteiro, R. D.C. (2019). Complexity of a quadratic penalty accelerated inexact proximal point method for solving linearly constrained nonconvex composite programs. *SIAM Journal on Optimization*, 29(4), 2566-2593.

5. **Kong, W.**, Liaw, C., Mehta, A., & Sivakumar, D. (2018). A new dog learns old tricks: RL finds classic optimization algorithms. *Proceedings of the International Conference on Learning Representations (ICLR 2019)*.

Working Papers & Preprints

1. **Kong, W.**, Melo, J.G., & Monteiro, R. D.C. (2021). FISTA and Extensions – Review and New Insights. arXiv preprint arXiv:2107.01267.

2. **Kong, W.** (2021). Accelerated Inexact First-Order Methods for Solving Nonconvex Composite Optimization Problems. arXiv preprint arXiv:2104.09685.

3. Melo, J.G., Monteiro, R.D.C., & **Kong, W.** (2020). Iteration-complexity of an inner accelerated inexact proximal augmented Lagrangian method based on the classical Lagrangian function and a full Lagrange multiplier update. arXiv preprint arXiv:2008.00562. (Submitted to *SIAM Journal on Optimization*)

4. **Kong, W.**, Melo, J.G., & Monteiro, R.D.C. (2020). Iteration-complexity of a proximal augmented Lagrangian method for solving nonconvex composite optimization problems with nonlinear convex constraints. *arXiv preprint arXiv: 2008.07080.* (Submitted to *Mathematics of Operations Research*)

5. **Kong, W.**, & Monteiro, R.D.C. (2020). Accelerated Inexact Composite Gradient Methods for Nonconvex Spectral Optimization Problems. *arXiv preprint arXiv: 2007.11772.* (Submitted to *Computational Optimization and Applications*)

INVITED & CONTRIBUTED TALKS

1. **Kong, W.**, & Monteiro, R.D.C. (2021, October 21–24) *Complexity Of A Dampened Proximal ADMM For Linearly-constrained Nonseparable Nonconvex Composite Optimization* [Invited Talk]. INFORMS Annual Meeting, Virtual.

2. **Kong, W.**, Melo, J.G., & Monteiro, R.D.C. (2021, September 18–19) *Iteration complexity of a proximal augmented Lagrangian method for constrained nonconvex composite programming* [Invited Talk], SIAM-SEAS, Virtual.

3. **Kong, W.**, & Monteiro, R. D.C. (2021, August 2–4) *A Smoothing Scheme for Nonconvex-Concave Min-Max Problems* [Contributed Talk], MOPTA, Virtual.

4. **Kong, W.**, Melo, J.G., & Monteiro, R.D.C. (2021, July 20–23) *Iteration Complexity of a Proximal Augmented Lagrangian Method for Solving Nonconvex Composite Optimization Problems with Nonlinear Convex Constraints* [Contributed Talk], SIAM Conference on Optimization, Virtual.

5. **Kong, W.**, & Monteiro, R.D.C. (2021, July 20–23) *An Accelerated Inexact Proximal Point Method for Solving Nonconvex-Concave Min-Max Problems* [Invited Talk], SIAM Conference on Optimization, Virtual.

6. **Kong, W.** (2020, November 9) *An Accelerated Proximal Point Method for Large-Scale Nonconvex Optimization* [Invited Talk], Oak Ridge National Lab's Research Seminar, Virtual.

7. **Kong, W.**, & Monteiro, R.D.C. (2020, November 7–13) *Accelerated Inexact Composite Gradient Methods For Solving Nonconvex Spectral Optimization Problems* [Invited Talk], INFORMS Annual Meeting, Virtual.

8. **Kong, W.**, Krichene, W., Mayoraz, N., Rendle, S., & Zhang, L. (2020, December 6–12) *Rankmax: An Adaptive Projection Alternative to the Softmax Function* [Poster Presentation], Conference on Neural Information Processing Systems, Virtual.

9. **Kong, W.**, Melo, J.G., & Monteiro, R.D.C. (2019, October 20–23) *Solving Nonconvex-Concave Min-Max Problems* [Invited Talk], INFORMS Annual Meeting, Virtual, Seattle WA, USA.

10. **Kong, W.**, Liaw, C., Mehta, A., & Sivakumar, D. (2019, May 6–9) *A New Dog Learns Old Tricks: RL Finds Classic Optimization Algorithms* [Poster Presentation], International Conference on Learning Representations, New Orleans LA, USA.

11. **Kong, W.**, & Monteiro, R.D.C. (2018, November 16) Nonconvex Optimization: Accelerating First-Order Methods [Invited Talk], ISyE DOS Seminar, Atlanta GA, USA.

12. **Kong, W.**, & Monteiro, R.D.C. (2018, November 2) Nonconvex Optimization: Accelerating First-Order Methods [Invited Talk], ISyE Student Seminar, Atlanta GA, USA.

HONORS & AWARDS

2020-2021	IDEaS-TRIAD Research Scholarship, $5,000 USD, *Georgia Institute of Technology / National Science Foundation (NSF)*
2018–2020	Alexander Graham Bell Postgraduate Scholarship, $63,000 CAD, *Natural Sciences and Engineering Research Council of Canada (NSERC)*
2016–2017	Thomas Johnson Fellowship, $6,000 USD, *Georgia Institute of Technology*
2010	Waterloo President's Scholarship, *University of Waterloo*
2010–2014	Queen Elizabeth II Aiming for the Top Scholarship, *Government of Canada*

RESEARCH EXPERIENCE

2021–Present   **Postdoctoral Research Associate**
Oak Ridge National Labs (ORNL), Oak Ridge TN, USA

- » Investigate new sparse grid methods for use in high-dimensional multiscale problems.
- » Develop production-level code in `C++` and `Python` for various computing projects in ORNL's other scientific directorates.
- » Collaborate with other ORNL researchers on contributing white papers and conferences.

2019   **Research Intern @ Google AI**
Google LLC, Mountain View CA, USA

- » Published a paper on sparse alternatives to the softmax function.
- » Developed new optimization frameworks for use in large-scale recommender systems.
- » Implemented these frameworks in `TensorFlow` to validate their effectiveness.

2016–2020   **Graduate Research Assistant**
Georgia Institute of Technology, Atlanta GA, USA

- » Designed and analyzed methods for large-scale nonconvex optimization problems.
- » Developed efficient `MATLAB` code for checking the practical performance of these methods.
- » Drafted and submitted grant proposals for funding existing and future research projects.

TEACHING EXPERIENCE

2016–2020   **Head Graduate Teaching Assistant**
Georgia Institute of Technology, Atlanta GA, USA

- » Deeply involved with courses on graduate topics in optimization theory ($\times 3$), applied operations research ($\times 3$), and probability theory ($\times 1$).
- » Designed and graded programming/written assignments, grading rubrics, and course projects.
- » Held lectures, exam reviews, weekly office hours, and one-on-one tutorial sessions.

2014   **Undergraduate Teaching Assistant**
University of Waterloo, Waterloo ON, Canada

- » Graded assignments in an applied real analysis course of 85+ students.

PROFESSIONAL EXPERIENCE

2018   **Software Engineering Intern @ Google AI**
Google LLC, Mountain View CA, USA

- » Published a paper on applying reinforcement learning to online optimization problems.
- » Developed production code in `C++` and `Python` for use in Google's internal database.

2013–2017   **Senior Risk Modeling Analyst**
TD Bank Financial Group, Toronto ON, Canada

- » Pioneered a new logistic regression variable selection method based on mutual information and variable effect maximization.
- » Developed production code in `SAS` for national and international regulatory tests.

2013   **Enterprise Risk Management Intern**
TD Bank Financial Group, Toronto ON, Canada

- » Created `VBA` macros to optimize several risk reports by up to 61% and 99% in time and memory efficiency, respectively.
- » Programmed `R` scripts to validate monthly data used in TD's front end risk metrics.

2012   **Defined Benefits Pension Intern**
Morneau Shepell, Toronto ON, Canada

- » Improved existing spreadsheets using `VBA` by up to 40% in time efficiency.
- » Analyzed actuarial valuations of pension figures for 4 teams spanning 8 companies.

PROFESSIONAL MEMBERSHIPS

2021–Present **Member**, SIAM Activity Group on Optimization (SIAG/OPT)

2021–Present **Member**, SIAM Activity Group on Computational Science and Engineering (SIAG/CSE)

2020–Present **Member**, Institute for Operations Research and the Management Sciences (INFORMS)

2018–Present **Member**, Society for Industrial and Applied Mathematics (SIAM)

SERVICES TO THE PROFESSION

Referee for the following journals and conferences: Computational Optimization and Applications, Annual Conference on Neural Information Processing Systems, International Conference on Learning Representations.

Session organizer for the following conferences: SIAM Southeastern Atlantic Section Conference

Developer for the following open-source scientific software: `NC-OPT`, `TASMANIAN`

OTHER SKILLS

Programming Languages: Working knowledge of `C++`, `MATLAB`, and `Python`. Some knowledge of `Julia`, `R`, `Haskell`, and `SQL`.

Software Packages: Experienced with `Gurobi`, `TensorFlow`, `SAS`, and `Condor`.

Administrative Experience: Held executive positions (President, Vice-President of Finance) at the University of Waterloo's Mathematical Finance Student Association (MFSA).